

with obliterative, disruptive, object-imitative, or mimetic adaptations are less frequently noticed, or, if noticed, are avoided; (b) those with misleading markings or deceptive transparency may be noticed but remain relatively inaccessible; (c) those with warning coloration associated with disagreeable traits are usually avoided. To express this in figures would mean little, however, since (a) enormous groups rather than a few species are involved, (b) relatively few species-determinations of rain-forest insects from any one locality are available, and (c) the ratio between adaptively and nonadaptively colored species must be, in the nature of the case, inconstant.

Since the recent literature, very adequately cited by Cott (1940), contains evidence on nocturnal behavior, on color vision in insects and other animals, and on the selective value of various kinds of adaptive coloration, this material is omitted from the present paper, although much that is pertinent might be taken from it.

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ZOOLOGY.—*The gender of scientific names in zoology*.¹ RICHARD E. BLACKWELDER, U. S. National Museum.

The scientific names of animals, according to the International Rules of Zoological Nomenclature, must be words that are either Latin or Latinized, or that are considered and treated as such in case they are not of classic origin. Both generic and specific names are to be formed according to the principles of Latin grammar and usually have Latin endings. Specific names must bear the proper modifying relation to the generic name and may have a variable ending for this purpose. For example, adjectives must agree in gender with the generic name, substantives in apposition must be in the nominative case, and possessive substantives must be in the genitive case.

Our Zoological Code specifies these principles and some others but

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A preliminary sheet showing the two tables included in this paper was distributed at the Taxonomists' Conference on Nomenclature at the Philadelphia meetings of the American Association for the Advancement of Science on December 29, 1940. Discussion at that meeting brought out the necessity for changing Table 1. Copies of the sheet should therefore be destroyed or changed to agree with the revised version herein presented.

in general places the responsibility upon the individual to know and follow the Latin grammar.

Most research in taxonomy has been done by persons of some education, and this has very frequently meant in the past a classical one. A thorough knowledge of both Latin and Greek was considered a necessity in any education, and nearly every taxonomist of a generation or more ago had a good working knowledge of both the principles and the vocabularies of these languages. At the present time, however, it is quite possible for a student to reach the highest steps of our formal education system without a knowledge of either of these languages, and in fact few students do in these days receive a really thorough training in either of them. It has become, therefore, increasingly difficult for modern taxonomists as a group to apply uniformly the Latin rules that should govern their actions in the choice and formation of names and the use of the proper endings. And this tendency has had a marked effect on the number of mistakes made by the persons who make use of zoological names.

Perhaps the commonest problem of this sort is the question of what ending to use when a specific name is transferred from one genus to another. For example, *Cylindropsis polita* is transferred to *Osorius* and must be changed to *Osorius politus*, since *polita* is an adjective and must agree in gender with the generic name which is a noun. If the specific name were *rufipennis*, it would not change, since the masculine and the feminine endings are the same in this declension. If the specific name were *ajax*, it would not change, since it is a substantive and these are not required to agree with the generic name in gender. Situations may be much less simple than this, as in the case of *Venus*, which is feminine in spite of its masculine ending, and such combinations as: *Tenaspis angulosa* (3d decl. f. noun and 1st decl. adjective), *Tenaspis angularis* (3d decl. f. noun and 3d decl. adjective), *Eros aurora* (3d decl. m. noun and 1st decl. f. noun in apposition), *Erotides hebes* (3d decl. f. noun and 3d decl. f. noun in apposition), *Sphex latus* (3d decl. m. noun and 2d decl. m. adjective), *Microps fungi* (3d decl. f. noun and 2d. decl. m. possessive noun), *Microps minor* (3d decl. f. noun and comparative adjective of 3d decl.).

A person who is not thoroughly familiar with each of the Latin declensions frequently is at a loss to know what change in ending should be made. Fortunately a large part of our names end in the familiar *us*, *a*, *um* endings and many more in the *is*, *is*, *e*. But even when one recognizes these, what about the *ger*, *gera*, *gerum* and *ger*, *gra*, *grum* endings, the *as*, *es*, *os*, *ps*, *rs*, *or*, *x*, etc., which never change,

and the *a*, *e*, *m*, *is*, etc., which sometimes change and sometimes do not when the gender of the generic name changes?

Then there are a considerable number of names that defy even the Latin rules by virtue of a gender inherent in their meanings. *Venus* takes feminine specific names and *Adonis* takes masculine, in direct opposition to the usual gender of words ending as these do. Many words ending in *a* derived from the Greek, such as *Conosoma* and *Strigoderma*, retain the neuter gender which they had in that language. There is no way to recognize these words from themselves, one must simply know in advance how they are to be used.

Like many of the younger entomologists I have encountered considerable difficulty in these matters because of my lack of a sufficient knowledge of Latin grammar and vocabulary. I find that there is a strong temptation to abandon these requirements and simply use at all times the exact original form of the specific name regardless of other considerations. I believe that this *will* be the result if we continue to base our procedure on the rules of grammar of a language not well known to all the people involved, but I also believe that this would be an unfortunate occurrence and that it can be prevented by the use of a simpler set of rules.

In the writings of Col. Thos. L. Casey² I chanced upon a suggestion which seemed to offer hope of a better solution. Col. Casey argued as follows³:

As generic and specific words are mere symbols for the designation of a species, it seems desirable that they should be withdrawn as far as possible from exceptions to general rules of grammar, and, that in this respect at least, they should be treated in the abstract as mere aggregations of letters. The rules of gender should be made uniform, so that generic symbols ending in a certain manner shall demand a certain definite and invariable gender in the specific symbol.

The only course left, therefore, is to consider the generic name as a simple harmonious combination of letters, having a Latin form, constructed without absolutely essential reference to rigidly correct orthography in the language from which it may have been derived, whether Greek, Latin, or aboriginal American, and subject to constant rules of gender which shall be independent of linguistic caprice. The word may or may not have a meaning in the original language from which it is taken, although in any event, the meaning is of but little material importance.

An attempt at uniformity involving a suppression of the rules of orthography, and made in a spirit similar to that which has prompted the above remarks, has recently come into quite general use—I allude to the growing custom of writing all specific names, whether proper or common, with a small initial letter. All such rules as this, which have for their object the attainment of simplicity and uniformity in scientific nomenclature, are undoubtedly very desirable.

² One of the most studious and prolific writers on Coleoptera of the past generation.

³ Ann. New York Acad. Sci. 5: 307-308. 1890.

Col. Casey proposes that for generic names the endings *as*, *es*, *os*, *us*, *r*, and *o* be established as masculine, that *a*, *is*, *s* preceded by a consonant, *ys*, *e*, and *x* be feminine, and that *m* and *n* be neuter. These would be invariable, the ending itself determining the gender of the name. In using the above rule for several years I have found it very useful but have wished for a more comprehensive list and also for a similar aid in determining what endings to use on the specific name in each case. By compiling lists of names and comparing them with Latin grammars I have been able to assemble a table of endings which does seem to make it possible to determine the proper ending in any case according to set rules and with a minimum of trouble.

Generic names formed by arbitrary combinations of letters may end with any letter, as *Anzac*, *Coati*, *Arrup*, *Biat*, and *Coendou*. These names appear to be valid under Article 3 of the Rules, but their gender is not a matter to be guessed offhand by anyone except the original author. Of the above names *Anzac*, *Arrup*, and *Coendou* were originally used as masculine, *Coati* and *Biat* were used as feminine. Although in some respects it would seem proper for an author to determine the gender of a name in such cases, it will lead only to confusion, since all subsequent users of the name will be under the necessity of referring to the original article to determine the gender. In order to avoid this and to reduce the matter to a single rule that can be fitted into the above system, the following has been compiled principally from Latin usages. Generic names ending in *b*, *c*, *d*, *f*, *g*, *h*, *j*, *l*, *p*, *q*, *t*, *v*, *w*, or *z* or in *i*, *u*, or *y* shall be considered to be neuter. When we combine this rule with Casey's list, we get Table 1, in which the possible endings of genera are grouped under the appropriate genders. It will enable one to determine the gender of any generic name by its ending.

TABLE 1

Masculine	Feminine	Neuter
er, ir or, os us, ex	a, e, as, es, is, s (preceded by a consonant), x (except ex)	b, c, d, f, g, h, i, j, k, l, m, n, o, p, q, ar, ur, t, u, v, w, y, z

To determine the proper ending for the specific name one must first know whether it is a substantive or an adjective. The endings of substantives can not be changed under any circumstances, but the endings of adjectives generally must be changed if there is a change of gender in the generic name.

Adjectives can end (in the singular⁴) only with the following letters or combinations: *a, e, um, er, is, us.*⁵ Names ending in these letters are likely to be adjectives but may occasionally be substantives. If one does not recognize any particular name as an adjective, resort must be had to a dictionary. However, unless such a name can be shown to be a substantive, it is best to treat it as an adjective and change its ending to agree with the generic name. For example, the name *nigrita* has been used at times as a substantive and at other times as an adjective. The derivation of the name is open to question, but much confusion can be avoided by treating it as an adjective.

In Table 2 an attempt has been made to indicate the gender of every possible ending of an adjective specific name (as herein restricted) and to show the proper endings of this name in the other genders as well. The gender of any ending in the first columns is indicated by the gender column in which the italics occur.

TABLE 2

Final Letter	Endings			Gender			Example
	Preceded by	(preceded by)	(preceded by)	Masc.	Fem.	Neut.	
a	r			<i>er</i>	<i>(e)ra</i>	<i>(e)rum</i>	rubra
a	(any other)			<i>us</i>	<i>a</i>	<i>um</i>	rugosa
e	⁴			<i>is</i>	<i>is</i>	<i>e</i>	acre
m	u	r		<i>er</i>	<i>(e)ra</i>	<i>(e)rum</i>	rubrum
m	u	(any other)		<i>us</i>	<i>a</i>	<i>um</i>	rugosum
r	e	ch		<i>er</i>	<i>ra</i>	<i>rum</i>	pulcher
r	e	n, p, s	a, e, ³ i, o, u	<i>er</i>	<i>era</i>	<i>erum</i>	tener
r	e	(any other)	a, ² e, o, u	<i>er</i>	<i>ra</i>	<i>rum</i>	sacer
r	e	(any other)	i, ¹ consonant ⁴	<i>er</i>	<i>era</i>	<i>erum</i>	armiger
s	i			<i>is</i>	<i>is</i>	<i>e</i>	debilis
s	u ⁵			<i>us</i>	<i>a</i>	<i>um</i>	rugosus

¹ Except *niger* and its compounds, and *piger*, which are *-iger, -igra, -igrum*.

² Except *lacer, -era, -erum* and *acer, alacer, -ris, -re*.

³ Except *degener, -eris, -ere*.

⁴ Except *volucer, -eris, -ere*, and the alternative masculines of many words, as *equester, equestris; paluster, palustris*; and *acer, acris*.

⁵ Except the neuter of comparative adjectives (*majus, minus, latius, etc.*) which are herein treated as substantives.

Names with any endings other than *a, e, um, er, is, us*, must be substantives (or adjectives treated as substantives), but as noted

⁴ Since the Rules specify that generic names must be in the nominative singular, the modifying adjectives must also be singular.

⁵ In Latin a few adjectives with imperfect or unusual declension in the singular may end in such combinations as: *i, am, em, ar, or, as, es, us, os, ps, and rs*. Except for the comparative adjectives (*or, ar, us*) these generally have the same form in all genders and they are all therefore herein treated as substantives rather than adjectives. Words ending in *x* cannot properly be said to be irregular or imperfect, but, since their endings are the same in all genders, they may be omitted from the table and treated with the substantives.

above substantives may end in any letter (especially *a, e, i, m, n, o, r, s, x*). The ending of a substantive does not ever change.

The foregoing statements have been made in part as though they were principles of Latin grammar and in part as though they were suggested departures therefrom. This is exactly the case and it will be well to recapitulate the changes that are proposed. If the names of animals are considered to be symbols for species and genera rather than Latin names for them, we find ourselves at once cut off from any set of rules of orthography. Our International Code specifies that "the scientific names of animals must be words which are either Latin or Latinized, or considered and treated as such in case they are not of classic origin." Our symbols can be included in the latter category. An improvement can be made, however, over the Latin usages of gender. Since our names are symbols and no longer have a meaning of their own, they no longer possess an inherent gender. It has been customary to assign a gender to them depending on the declension to which they would have belonged in Latin, but there were exceptions due to inherent gender in the words themselves, for example *Venus* (feminine) and *Adonis* (masculine). In many cases writers have never been able to agree on the proper gender, one basing his claim on the structure of the word and the other upon its original meaning. All this could be avoided in the future by the adoption of a fixed gender for each possible ending, these being based on Latin grammar but being more comprehensive while admitting no exceptions.

The only change then is a standardization of the few variables that now exist and the addition of a few new factors to cover names which could not have existed in true Latin. The aim is uniformity in the agreement of specific names with generic names, and I believe that the proposals here made can be accepted into our present procedures without any change in the International Rules. Names will still be treated as if they were of classic origin, they will still agree grammatically with the generic name. We need only interpret the word "grammatically" to include a more rigid rule of ending than in the previous use of Latin grammar.